Deep Learning
for image recognition

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About this tutorial

I want to give you

- an basic understanding of Deep Learning and
- the superpower to apply it to your own problems.

But

- Deep Learning is not a magic black box like RF or SVM, so
- ➡ understanding the theory necessary to use it successfully.

Consequence

- First day more talking
- Second day more experimentation

Prerequisites

- Knowledge of basic machine learning concept like "classifier", "training/fitting", "testing" and "evaluation"…

- Experience with matrix operations using `numpy`

- using other ML algorithms using `sklearn`

- High school math (derivatives)

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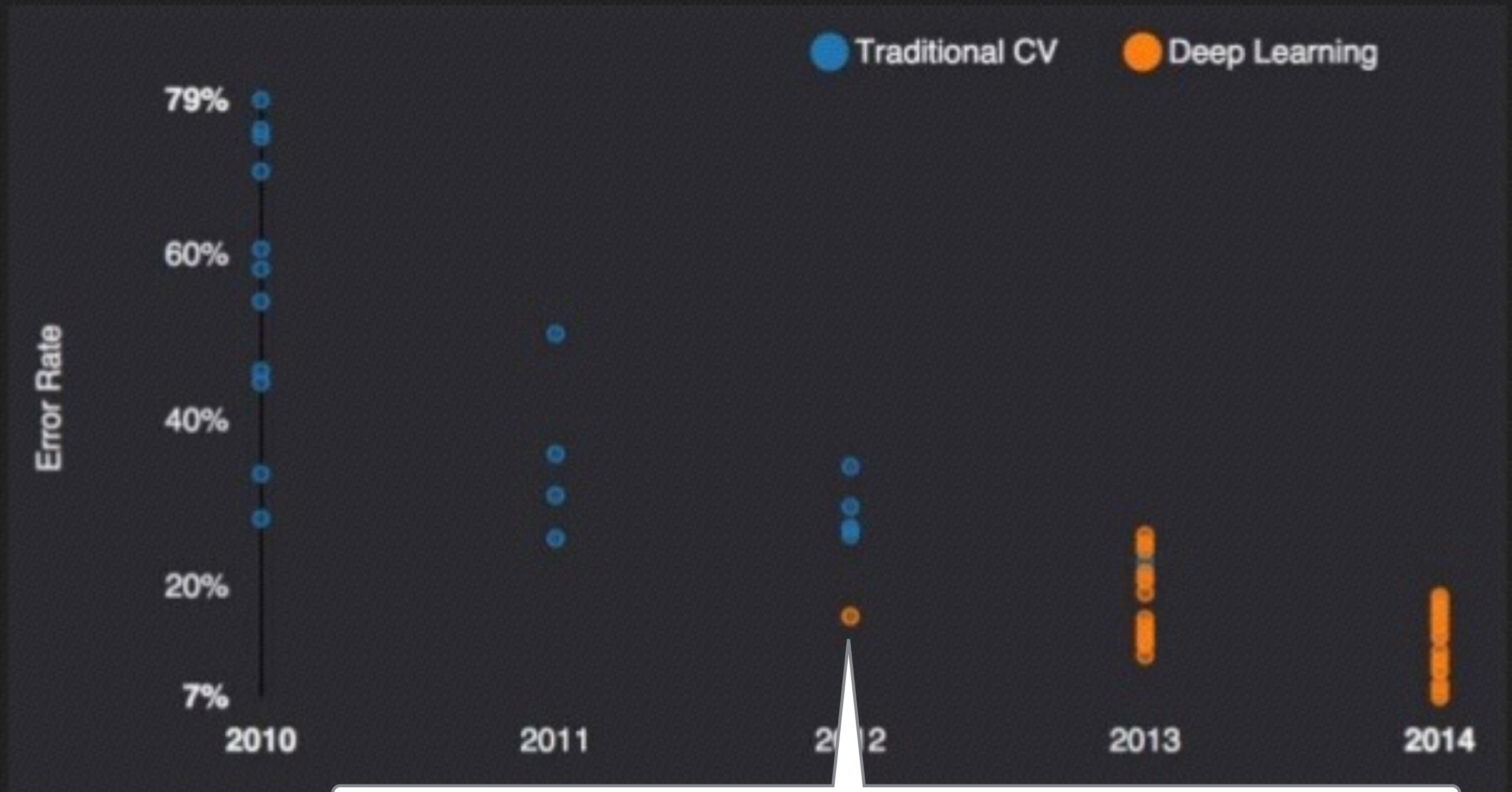- **Don't be afraid to ask!**

Deep Learning

Why are we talking about it?

ImageNet Error Rate 2010-2014

Krizhevsky, A., Sutskever, I. and Hinton, G. E.
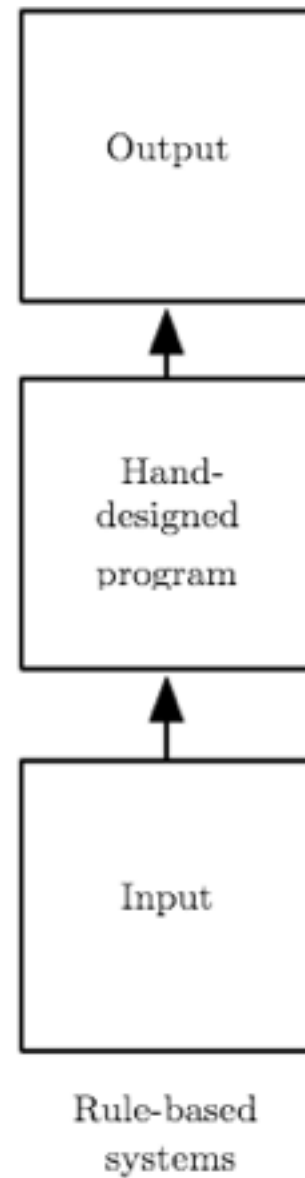ImageNet Classification with Deep Convolutional Neural Networks

Demos

- EyeEm:
www.eyeem.com/tech

- Clarifai:
www.clarifai.com/#demo

What is
Deep Learning?

The evolution of Machine Learning

Output

Hand-
designed
program

Input

Rule-based
systems

The evolution of Machine Learning
(gray boxes are learned from data)
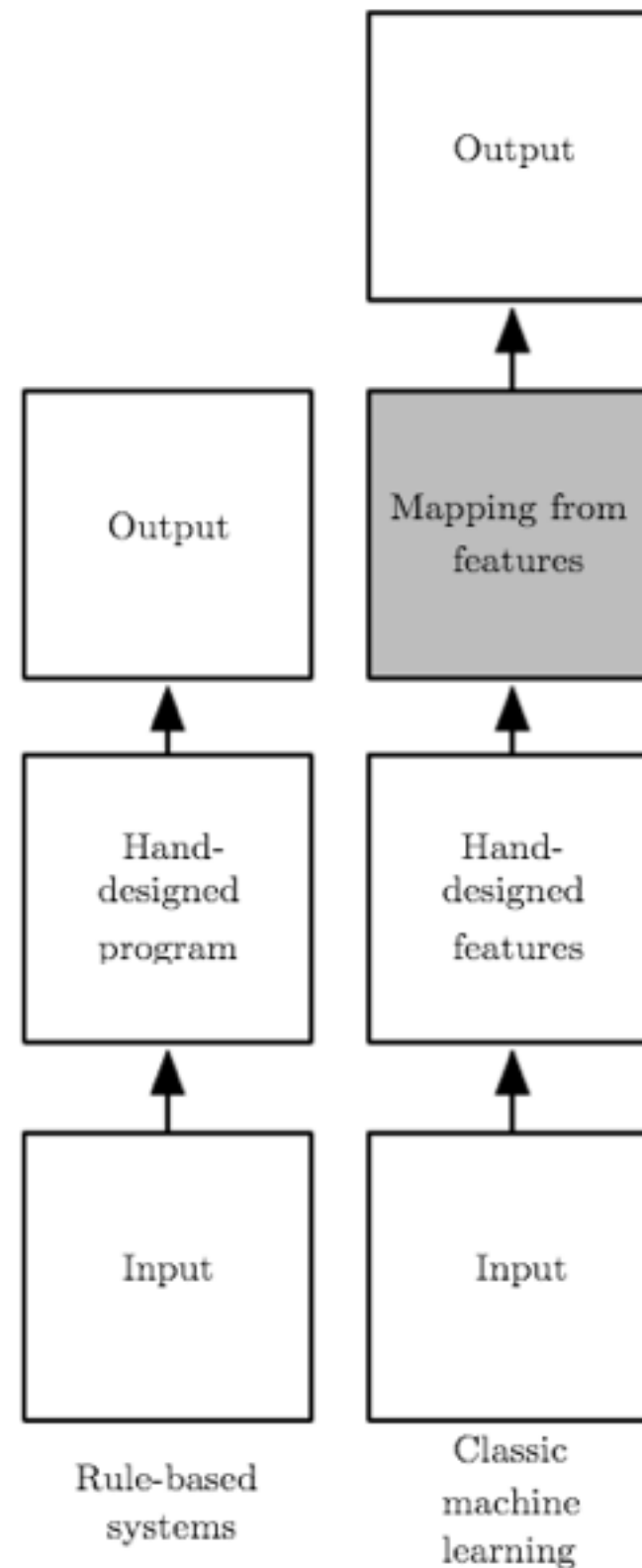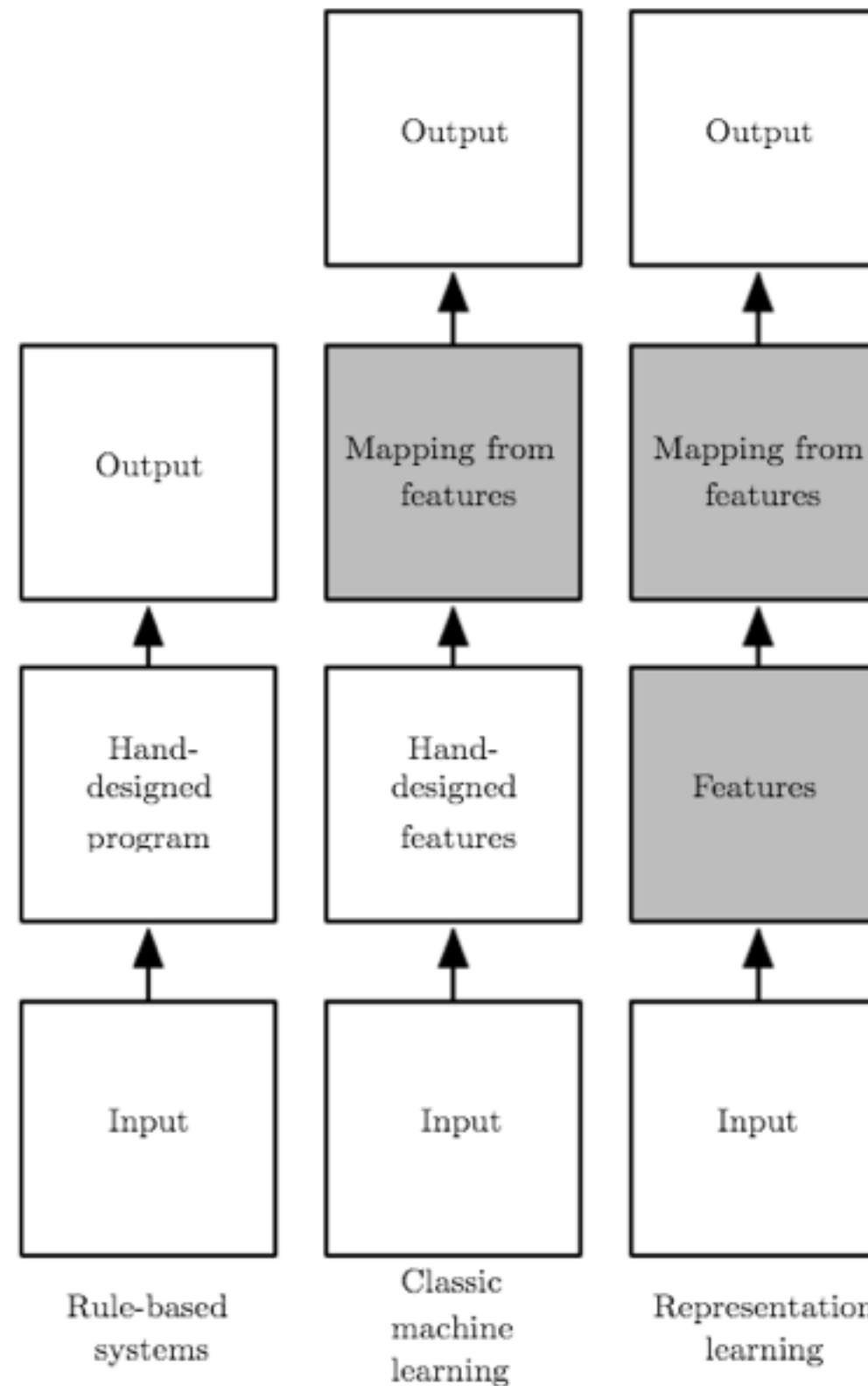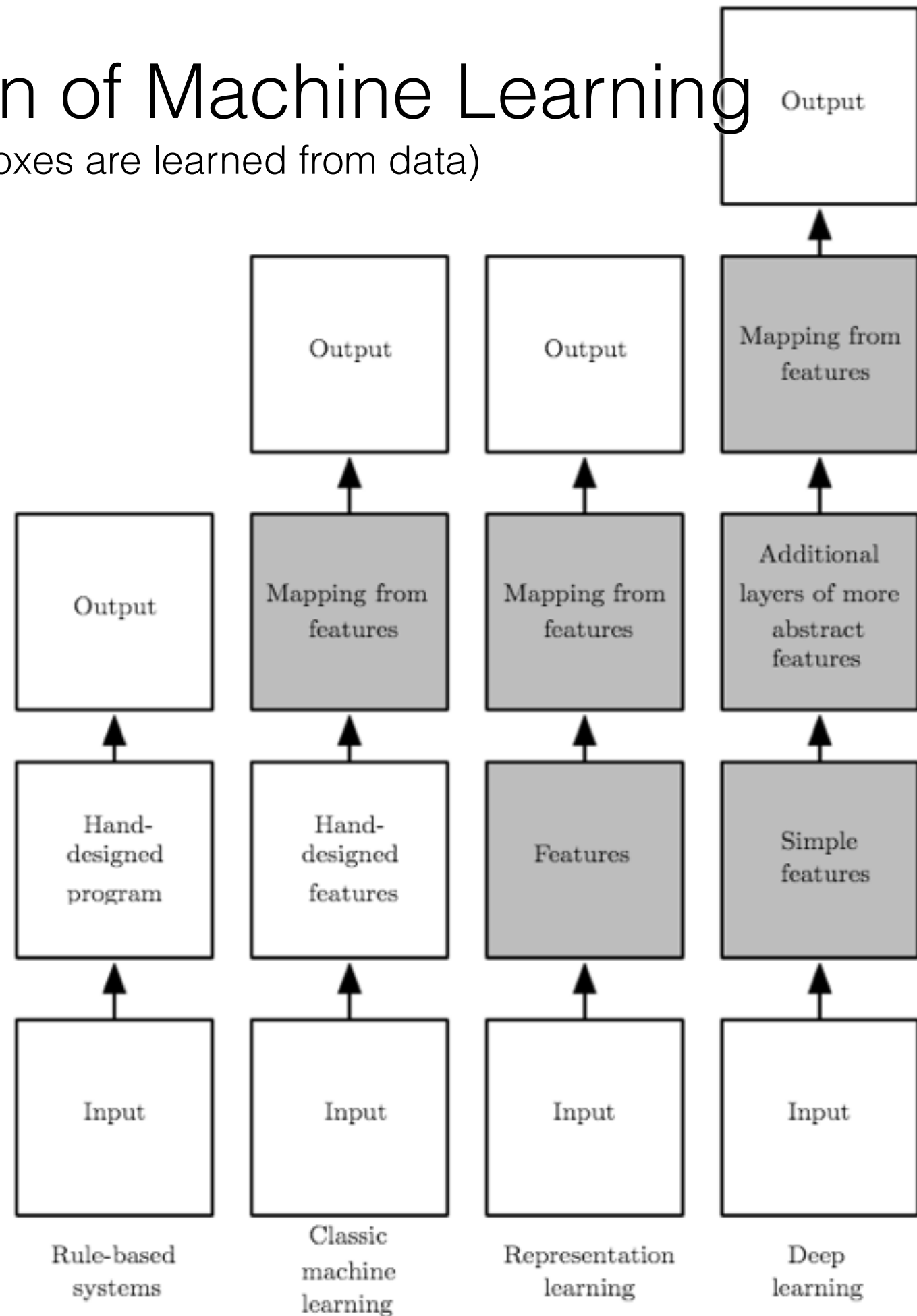
The evolution of Machine Learning

(gray boxes are learned from data)

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| | Output |
| | |

Output	Output	Mapping from features

Output	Mapping from features	Mapping from features	Additional layers of more abstract features

Hand-designed program	Hand-designed features	Features	Simple features

Input	Input	Input	Input

Rule-based systems	Classic machine learning	Representation learning	Deep learning

Deep learning

- is a host of statistical machine learning techniques

- is generally based on artificial neural networks

- enables the automatic learning of feature hierarchies

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- is generally based on artificial neural networks

- **enables the automatic learning of feature hierarchies**

    ➡ **No more feature engineering!**

How does Deep Learning work?

Main Deep Learning approaches

- Deep Belief Networks (DBN)

- Recurrent Neural Networks (RNN)

- Convolutional Neural Networks (CNN)

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➡ Next stop: (Artificial) **Neural Networks**